

PATENT ABSTRACTS OF JAPAN

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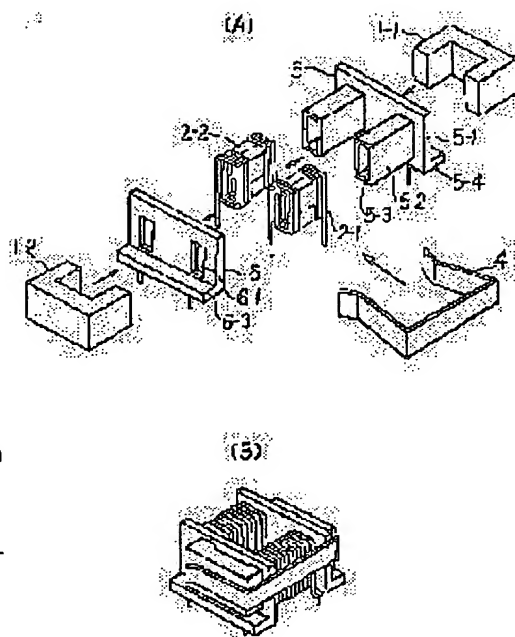
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(54) INDUCTOR AND SPLIT-TYPE COIL HOLDER

(57)Abstract:

PURPOSE: To obtain a highly reliable inductor and transformer having small sizes and large current capacities by preventing the breakage of a coil holder even when a strong force is applied to the holder at the time of winding a conductor around the holder, when a residual stress in the winding acts on the holder after the winding is wound, or when the temperature of the coil rises due to conduction and, at the same time, by reducing the thickness of the holder.

CONSTITUTION: After mounting air-core windings 2-1 and 2-2 on the cylindrical insulator 5-2 of a coil holder section 5, the insulator 5-2 is put in the grooves of the cylindrical insulator of an independent flange 6. Then iron cores 1-1 and 1-2, section 5, flange 6, and windings 2-1 and 2-2 are press-contacted to each other as a whole and assembled in one body by inserting the iron cores 1-1 and 1-2 in and mounted on the insulator 5-2 respectively through the opening 5-3 for inserting iron core of the section 5 and the opening 6-1 for inserting iron core of the flange 6 and pressing both end faces of the cores 1-1 and 1-2 with a plate spring 4.



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CLAIMS

[Claim(s)]

[Claim 1] The inductor characterized by constituting the structure divorced from the iron core inserted in opening for iron core insertion while pinching an air core coil with the flange of the coil electrode-holder section, and the independent flange by consisting of an independent flange characterized by providing the following, equipping a tubed insulator with an air core coil, and equipping with the flange which became independent at the edge of a tubed insulator so that the fitting slot of the tubed insulator may fit in. The coil electrode-holder section of the integral construction which consists of a flange equipped with opening for iron core insertion, and a tubed insulator. The fitting slot and opening for iron core insertion of a tubed insulator which carried out simultaneously coincidence in the thickness direction at the cross-section size of a tubed insulator.

[Claim 2] By consisting of an independent flange characterized by providing the following, equipping a tubed insulator with an air core coil, and equipping with the flange which became independent at the edge of a tubed insulator so that the fitting slot of the tubed insulator may fit in. The divided type coil electrode holder characterized by constituting the structure divorced from the iron core inserted in opening for iron core insertion while pinching an air core coil with the flange of the coil electrode-holder section, and the independent flange. The coil electrode-holder section of the integral construction which consists of a flange equipped with opening for iron core insertion, and a tubed insulator. The fitting slot and opening for iron core insertion of a tubed insulator which carried out simultaneously coincidence in the thickness direction at the cross-section size of a tubed insulator.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001] [Industrial Application] this invention relates to the inductor of the high current capacity which consists of the coil electrode-holder sections which were divided into E typefaces and E typeface which are used for the power circuit of electronic equipment etc., I typeface, U typefaces or U typeface, and I typeface, and which combine and insulate an iron core, an air core coil, and an air core coil with wearing and an iron core, or the coil electrode holder of a transformer.

[0002] Although the term a "coil electrode holder" should be called "inductance element electrode holder" when the object of invention is an inductor, since this invention is carried out also for a transformer, it is called "coil electrode holder" in this book, without distinguishing according to the object of invention.

[0003]

[Description of the Prior Art] According to the value of an inductor which needs an inductor or a transformer, number of turns, the current value which flows to a coil, the size demanded, not only the kind of magnetic material which forms the structure of an iron core, size, and an iron core but also the size of a coil, structure, etc. is selected, and it consists of various configurations and structure. When the technology about the method of holding the general conventional coil is illustrated about an inductor, there is a method which wraps an iron core in two insulating caps to whom the insulating tape was wound around the circumference of an iron core, or the cross section carried out the same ring form as an iron core by the shape of U character, secures an insulation, winds lead wire directly, and forms the so-called toroidal coil in a ring-like iron core, for example. While a toroidal coil pulls out the maximum property of a magnetic material, since a disclosure magnetic field is also small, it can be said to be ideal as an inductor of small current capacity. However, magnetic saturation is started easily and it is not used to pass large current and obtain a comparatively high inductance. In this case, although usually prepares a magnetic gap into the magnetic circuit which an iron core constitutes and it may prepare a magnetic gap in some ring-like iron cores since magnetic saturation is prevented, in order to facilitate a coil, the coil (coil) which was generally divided [iron core / U typeface / U typeface] and which combined and became independent of an iron core is used in many cases, pass opening for iron core insertion in an iron core after attaching in a winding machine the coil electrode holder (winding frame) which unified the tubed insulator which has opening for iron core insertion, and two or more flanges, winding lead wire and forming a coil — the iron core which inserted in the coil electrode holder and was divided with flat spring, a band, or adhesive tape -- junction -- or a pressure welding is carried out

[0004] The high current capacity inductor of a Prior art is illustrated to drawing 4 . The flat spring 4 for carrying out conclusion fixation of the whole, after inserting the iron core (U typeface and U typeface should put together) 1-1 divided into drawing 4 (A), 1-2, the coil electrode holder (winding frame) 3-1 around which lead wire 2 was wound directly, 3-2 and the divided iron core 1-1, and 1-2 in a winding frame 3-1 and 3-2 decomposes, and is shown. The state where it assembled is shown in drawing 4 (B). In this conventional example, in order to wind

direct lead wire around the winding frame which unified the tubed insulator which has opening for iron core insertion, and two or more flanges, when a comparatively thick lead wire was wound like a high current capacity inductor, the coil electrode holder was often further damaged by the mighty force impressed to a tubed insulator and a flange with lead wire, the residual stress of the coil after winding, the temperature rise by energization, etc. Therefore, in order to prevent breakage of a coil electrode holder, thickness of the tubed insulation section, a flange, and a joint needed to be thickened, and in order for the space ***** coil window surface product of a coil not to obtain an oak colander small relatively but to, obtain the required number of winding as a result, there was a difficulty of enlarging an iron core. In addition, although the terminal used at the time of mounting to the terminal and printed circuit board which connect electric conduction is generally attached to the flange, the terminal and terminal of lead wire are omitted by drawing 4 .

[0005]

[Problem(s) to be Solved by the Invention] improve the difficulty of the aforementioned Prior art, and it is made for a coil electrode holder (winding frame) not to be damaged, and this invention tends to make thin thickness which is the tubed insulation section and the flange of a coil electrode holder, and tends to offer the inductor and transformer of high current capacity with it [it is reliable and small]

[0006]

[Means for Solving the Problem] The coil electrode-holder section of the integral construction which consists of a flange equipped with opening for iron core insertion, and a tubed insulator in order that this invention may solve the aforementioned technical problem. It becomes the cross-section size of a tubed insulator from the independent flange equipped with the fitting slot of a tubed insulator and opening for iron core insertion which carried out simultaneously coincidence in the thickness direction. By equipping a tubed insulator with an air core coil, and equipping with the flange which became independent at the edge of a tubed insulator so that the fitting slot of the tubed insulator may fit in While pinching an air core coil with the flange of the coil electrode-holder section, and the independent flange, the inductor and divided type coil electrode holder which are characterized by constituting the structure divorced from the iron core inserted in opening for iron core insertion are adopted as a means.

[0007]

[Example] An inductor is explained for the high current capacity of the example of this invention with reference to a drawing.

[0008] First, the example 1 of this invention is shown in drawing 1 and drawing 2 . In drawing 1 (A), the coil electrode-holder section 5 consists of a flange 5-1 and a tubed insulator 5-2, and the opening 5-3 for iron core insertion is formed in the flange 5-1. As shown in drawing 2 in detail, the fitting slot 6-2 of the tubed insulator which was mostly in agreement with the cross-section size of the opening 6-1 for iron core insertion and the tubed insulator 5-2 is established in the independent flange 6.

[0009] After equipping the tubed insulator 5-2 of the coil electrode-holder section 5 with the air core coil 2-1 wound in the shape of an air core, and 2-2, the tubed insulator 5-2 is fitted into the fitting slot 6-2 of the tubed insulator of the independent flange 6. It passes through the opening 5-3 for iron core insertion of the iron core 1-1 coil electrode-holder section 5, then, to the tubed insulator 5-2 it passes through the opening 6-1 for iron core insertion of the flange 6 which became independent about the iron core 1-2, to the tubed insulator 5-2 Further, the iron core 1-1 and ends side of 1-2 is inserted by flat spring 4, the pressure welding of an iron core 1-1, 1-2, the coil electrode-holder section 5, the independent flange 6, a coil 2-1, and the 2-2 whole is carried out, insertion wearing is carried out, respectively and conclusion fixation is carried out [it assemblies like drawing 1 (B) and] .

[0010] In addition, in this example, although flat spring is adopted as a conclusion fixed means of an inductor, conclusion fixation can also be carried out on a tape with adhesives, moreover, the inductor whole -- an insulating varnish -- conclusion fixation can also be carried out with an adhesive resin [like] In the case of the division iron core of a laminating form, an adhesive resin is especially effective.

[0011] Next, when the number of the flanges of the example 2 of this invention is three, the case where they are 2 sectional winding lines is shown in drawing 3. As shown in drawing 3 (A), an inductor consists of the two coil electrode-holder section 5 from which the flange 5-1 and the tubed insulator 5-2 became integral construction, four divided coils 2-1, 2-2, 2-1 and 2-2, a middle independent flange 7, an iron core 1-1 and 1-2, and flat spring 4 (not shown). It cannot be overemphasized that the fitting slot of a tubed insulator and opening for iron core insertion which carried out simultaneously coincidence are prepared in the cross-section size of the tubed insulator 5-2 of the coil electrode-holder section 5 at middle independent both sides of a flange 7.

[0012] By flat spring 4, the pressure welding of the whole is carried out, and an example 2 is also assembled like drawing 3 (B), and carries out conclusion fixation. [as well as an example 1]

[0013] moreover, to the flange 5-1 of the coil electrode-holder section 5 of an example 1, the independent flange 6, and the flange 5-1 of the two coil electrode-holder section 5 of an example 2 Although the structure which the pedestal 5-4 which makes these and a right angle, and 6-3 were prepared, and prepared the terminal for making connection or connection with a printed circuit board for a coil terminal is shown In the case of the coil of a thick lead wire, the terminal of lead wire itself can also be made into a direct end-connection child, a guide rail is prepared in the flange section itself, it can go along with a guide rail, the terminal of lead wire can be pulled out, and the precision of an end-connection child's cash-drawer location dimension can be improved.

[0014] this invention cannot be overemphasized by that it is that there are only many numbers (phase) of a coil in the case of a transformer, and can apply with the completely same means as an inductor also for a transformer although the aforementioned example 1 and the example 2 explained the inductor.

[0015]

[Effect of the Invention] Since according to this invention there is no winding in the coil electrode-holder section about direct lead wire and it can use effectively, the coil space, i.e., the window surface product, which can make thin thickness of the tubed insulation section of the coil electrode-holder section for there being no breakage of the coil electrode-holder section (winding frame), and securing maintenance of a coil, and the insulation with an iron core and lead wire, and a flange, and an iron core forms, the inductor and transformer of high current capacity with it are obtained. [it

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the high current capacity inductor of the example 1 of this invention, and the perspective diagram in the state where (A) was decomposed, and (B) show the perspective diagram in the state where it assembled, respectively.
[Drawing 2] It is the perspective diagram showing the important section of the independent flange in the example 1 of this invention.
[Drawing 3] It is the sectional winding alignment high current capacity inductor of the example 2 of this invention, and the perspective diagram in the state where (A) was decomposed, and (B) show the perspective diagram in the state where it assembled, respectively.
[Drawing 4] It is the high current capacity inductor of a Prior art, and the perspective diagram in the state where (A) was decomposed, and (B) show the perspective diagram which is in the assembled state, respectively
[Description of Notations]
1-1, 1-2 Iron core
2 Coil
2-1, 2-2 Air core coil
3-1, 3-2 Coil electrode holder (winding frame)
4 Flat Spring
5 Coil Electrode-Holder Section
5-1 Flange
5-2 Tubed Insulator
5-3, 6-1 Opening for iron core insertion
5-4, 6-3 Pedestal
6 Seven Independent flange
6-2 Fitting Slot of Tubed Insulator

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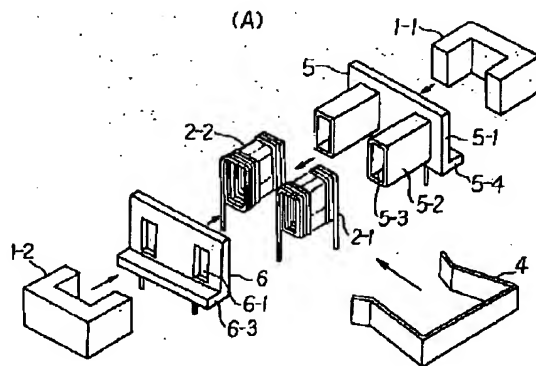
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(54) 【発明の名称】 インダクタ及び分割形コイルホルダ

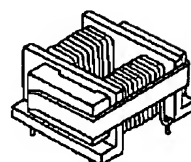
(57) 【要約】

【目的】 コイルホルダに導線を巻回する場合に印加される強大な力、更に巻回後の巻線の残存応力、通電による温度上昇等によって、コイルホルダが破損しないようにし、かつ、コイルホルダの肉厚を薄くし、信頼性が高く小型の大電流容量のインダクタとトランスとを提供する。

【構成】 空芯巻線2-1、2-2をコイルホルダ部5の筒状絶縁体5-2に装着した後、独立したつば6の筒状絶縁体の嵌合溝に筒状絶縁体5-2を嵌合する。続いて、鉄芯1-1をコイルホルダ部5の鉄芯挿入用開口部5-3を経て筒状絶縁体5-2に、鉄芯1-2を独立したつば6の鉄芯挿入用開口部6-1を経て筒状絶縁体5-2に、それぞれ挿入装着し、更に、板ばね4で鉄芯1-1及び1-2の両端面側を挟み、鉄芯1-1、1-2、コイルホルダ部5、独立したつば6、巻線2-1及び2-2全体を圧接し、組立てて締結固定する。



(B)



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【特許請求の範囲】

【請求項1】 鉄芯挿入用開口部を備えたつばと筒状絶縁体からなる一体構造のコイルホルダ部と、その厚さ方向に筒状絶縁体の断面寸法にほぼ一致した筒状絶縁体の嵌合溝及び鉄芯挿入用開口部を備えた独立したつばからなり、筒状絶縁体に空芯巻線を装着し、筒状絶縁体の端部に独立したつばをその筒状絶縁体の嵌合溝が嵌合するように装着することにより、空芯巻線をコイルホルダ部のつばと独立したつばで挟持するとともに鉄芯挿入用開口部に挿入される鉄芯と絶縁する構造を構成することを特徴とするインダクタ。

【請求項2】 鉄芯挿入用開口部を備えたつばと筒状絶縁体からなる一体構造のコイルホルダ部と、その厚さ方向に筒状絶縁体の断面寸法にほぼ一致した筒状絶縁体の嵌合溝及び鉄芯挿入用開口部を備えた独立したつばからなり、筒状絶縁体に空芯巻線を装着し、筒状絶縁体の端部に独立したつばをその筒状絶縁体の嵌合溝が嵌合するように装着することにより、空芯巻線をコイルホルダ部のつばと独立したつばで挟持するとともに鉄芯挿入用開口部に挿入される鉄芯と絶縁する構造を構成することを特徴とする分割形コイルホルダ。

【発明の詳細な説明】

【0001】

【産業上の利用分野】 本発明は、電子機器の電源回路等に用いられるE字形同士、E字形とI字形、U字形同士又はU字形とI字形に分割された組合せ鉄芯と、空芯巻線と、空芯巻線を装着及び鉄芯と絶縁するコイルホルダ部から構成される大電流容量のインダクタ又はトランスのコイルホルダに関する。

【0002】 「コイルホルダ」という用語は、発明の対象がインダクタの場合には「インダクタンス素子ホルダ」というべきであるが、本発明はトランスをも対象とするから、本書では発明の対象に応じて区別せずに「コイルホルダ」という。

【0003】

【従来の技術】 インダクタ又はトランスは、必要とするインダクタの値、巻数、巻線に流れる電流値、要求されるサイズ等に応じて、鉄芯の構造、サイズ、鉄芯を形成する磁性材料の種類はもとより、巻線の太さ、構造等を選定されて、様々な形状、構造で構成されている。一般的な従来の巻線の保持法に関する技術をインダクタについて例示すると、例えばリング状の鉄芯には、鉄芯の周囲に絶縁テープを巻くか、断面がU字状で鉄芯と同様のリング形をした2個の絶縁キャップで鉄芯を包んで絶縁を確保し導線を直接巻回していわゆるトロイダルコイルを形成する方式がある。トロイダルコイルは、磁性材料の最大限の特性を引き出すと同時に漏洩磁界も小さいため、小電流容量のインダクタとして理想的といえる。しかし、大きい電流を流し、かつ、比較的高いインダクタンスを得たい場合には、容易に磁気飽和を起こし実用に

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ならない。この場合、磁気飽和を防止するため鉄芯が構成する磁気回路中に磁気ギャップを設けるのが通例であり、リング状の鉄芯の一部に磁気ギャップを設けることもあるが、巻線を簡便化するために一般には例えばU字形とU字形鉄芯等の分割された組合せ鉄芯と独立した巻線（コイル）を利用することが多い。鉄芯挿入用開口部を有する筒状絶縁体と複数のつばを一体化したコイルホルダ（巻枠）を巻線機に取付けて導線を巻回して巻線を形成した後、鉄芯を鉄芯挿入用開口部を経てコイルホルダに挿入し、板ばね、帯又は接着テープ等で分割された鉄芯を接合又は圧接する。

【0004】 従来の技術の大電流容量インダクタを図4に例示する。図4（A）に分割された鉄芯（U字形とU字形の組合せ）1-1、1-2、導線2が直接巻回されたコイルホルダ（巻枠）3-1、3-2及び分割された鉄芯1-1、1-2を巻枠3-1、3-2に挿入した後全体を締結固定するための板ばね4が、分解して示され、組立てた状態が、図4（B）に示されている。この従来例では、鉄芯挿入用開口部を有する筒状絶縁体と複数のつばを一体化した巻枠に直接導線を巻回するため、大電流容量インダクタのように比較的太い導線を巻回する場合には、筒状絶縁体及びつばに導線により印加される強大な力、更に巻回後の巻線の残存応力、通電による温度上昇等により、しばしばコイルホルダが破損していた。したがって、コイルホルダの破損を防止するために筒状絶縁部、つば及び接合部の肉厚を厚くする必要があり、その結果巻線のスペースいわゆる巻線窓面積が相対的に小さくならざるを得ず、必要な巻回数を得るためには鉄芯を大きくせざるを得ない等の難点があった。なお、一般につばには、導線を接続する端末及びプリント基板への実装時に用いられる端子が付属しているが、導線の端末及び端子は、図4には省略されている。

【0005】

【発明が解決しようとする課題】 本発明は、前記従来の技術の難点を改良して、コイルホルダ（巻枠）が破損しないようにし、かつ、コイルホルダの筒状絶縁部及びつばの肉厚を薄くし、信頼性が高く小型の大電流容量のインダクタとトランスとを提供しようとするものである。

【0006】

【課題を解決するための手段】 本発明は、前記課題を解決するために、鉄芯挿入用開口部を備えたつばと筒状絶縁体からなる一体構造のコイルホルダ部と、その厚さ方向に筒状絶縁体の断面寸法にほぼ一致した筒状絶縁体の嵌合溝及び鉄芯挿入用開口部を備えた独立したつばからなり、筒状絶縁体に空芯巻線を装着し、筒状絶縁体の端部に独立したつばをその筒状絶縁体の嵌合溝が嵌合するように装着することにより、空芯巻線をコイルホルダ部のつばと独立したつばで挟持するとともに鉄芯挿入用開口部に挿入される鉄芯と絶縁する構造を構成することを特徴とするインダクタ及び分割形コイルホルダを、手段

として採用する。

【0007】

【実施例】本発明の実施例の大電流容量をインダクタを図面を参照して説明する。

【0008】まず、本発明の実施例1を図1及び図2に示す。図1(A)において、コイルホルダ部5は、つば5-1と筒状絶縁体5-2とからなり、つば5-1には鉄芯挿入用開口部5-3が設けられている。詳細には図2に示されるように、独立したつば6には鉄芯挿入用開口部6-1及び筒状絶縁体5-2の断面寸法にほぼ一致した筒状絶縁体の嵌合溝6-2が設けられている。

【0009】空芯状に巻回された空芯巻線2-1、2-2をコイルホルダ部5の筒状絶縁体5-2に装着した後、独立したつば6の筒状絶縁体の嵌合溝6-2に筒状絶縁体5-2を嵌合する。続いて、鉄芯1-1コイルホルダ部5の鉄芯挿入用開口部5-3を経て筒状絶縁体5-2に、鉄芯1-2を独立したつば6の鉄芯挿入用開口部6-1を経て筒状絶縁体5-2に、それぞれ挿入装着し、更に、板ばね4で鉄芯1-1及び1-2の両端面側を挟み、鉄芯1-1、1-2、コイルホルダ部5、独立したつば6、巻線2-1及び2-2全体を圧接し、図1(B)のように組立てて締結固定する。

【0010】なお、本実施例では、インダクタの締結固定手段として板ばねを採用するが、接着剤付きのテープにより締結固定することもできる。また、インダクタ全体を絶縁ワニスような接着性樹脂により締結固定することもできる。特に積層形の分割鉄芯の場合には、接着性樹脂が有効である。

【0011】次に、本発明の実施例2のつばの数が3個の場合即ち2分割巻線の場合を図3に示す。図3(A)に示すように、インダクタは、つば5-1と筒状絶縁体5-2とが一体構造となった2個のコイルホルダ部5と、分割された4個の巻線2-1、2-2、2-1、2-2と、中間の独立したつば7と、鉄芯1-1、1-2と、板ばね4(図示せず)とから構成される。中間の独立したつば7の両面には、コイルホルダ部5の筒状絶縁体5-2の断面寸法にほぼ一致した筒状絶縁体の嵌合溝及び鉄芯挿入用開口部が設けられていることは、いうまでもない。

【0012】実施例2も実施例1と同様に、板ばね4で全体を圧接し、図3(B)のように組立てて締結固定する。

【0013】また、実施例1のコイルホルダ部5のつば5-1及び独立したつば6並びに実施例2の2個のコイルホルダ部5のつば5-1には、これらと直角をなす基

台部5-4、6-3が設けられ、巻線端末を接続又はプリント基板への接続をするための端子を設けた構造を示しているが、太い巻線の巻線の場合には例えば巻線の端末自身を直接の接続端子とすることもでき、つば部自身に案内溝を設け、案内溝に副って巻線の端末を引出し、接続端子の引出し位置寸法の精度を向上することができる。

【0014】前記実施例1及び実施例2では、インダクタについて説明したが、本発明は、トランスをも対象とするものであり、トランスの場合には巻線の(相)数が多いのみで、インダクタと全く同様の手段で適用が可能であることは、いうまでもない。

【0015】

【発明の効果】本発明によれば、コイルホルダ部に直接巻線を巻回しないから、コイルホルダ部(巻棒)の破損がなく、かつ、巻線の保持及び鉄芯と巻線との絶縁を確保するためのコイルホルダ部の筒状絶縁部並びにつばの肉厚を薄くすることができ、鉄芯が形成する巻線スペース即ち窓面積を有効に利用できるので、信頼性が高く小型の大電流容量のインダクタとトランスとが得られる。

【図面の簡単な説明】

【図1】本発明の実施例1の大電流容量インダクタであり、(A)は、分解した状態の斜視図、(B)は、組立てた状態の斜視図を、それぞれ示す。

【図2】本発明の実施例1における独立したつばの要部を示す斜視図である。

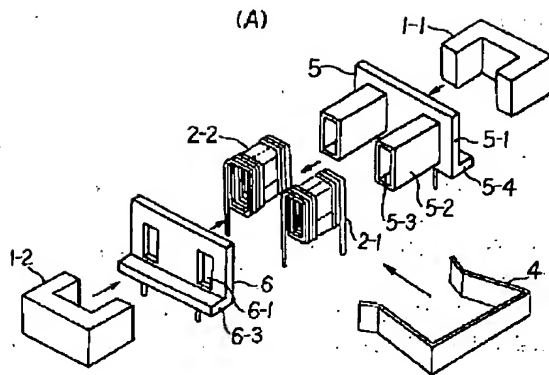
【図3】本発明の実施例2の分割巻線形大電流容量インダクタであり、(A)は、分解した状態の斜視図、(B)は、組立てた状態の斜視図を、それぞれ示す。

【図4】従来の技術の大電流容量インダクタであり、(A)は、分解した状態の斜視図、(B)は、組立てた状態の斜視図を、それぞれ示す。

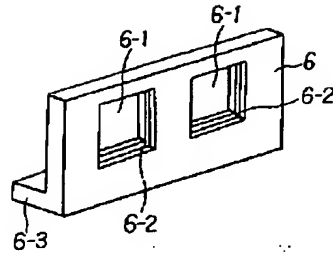
【符号の説明】

- 1-1, 1-2 鉄芯
- 2 巻線
- 2-1, 2-2 空芯巻線
- 3-1, 3-2 コイルホルダ(巻棒)
- 4 板ばね
- 5 コイルホルダ部
- 5-1 つば
- 5-2 筒状絶縁体
- 5-3, 6-1 鉄芯挿入用開口部
- 5-4, 6-3 基台部
- 6, 7 独立したつば
- 6-2 筒状絶縁体の嵌合溝

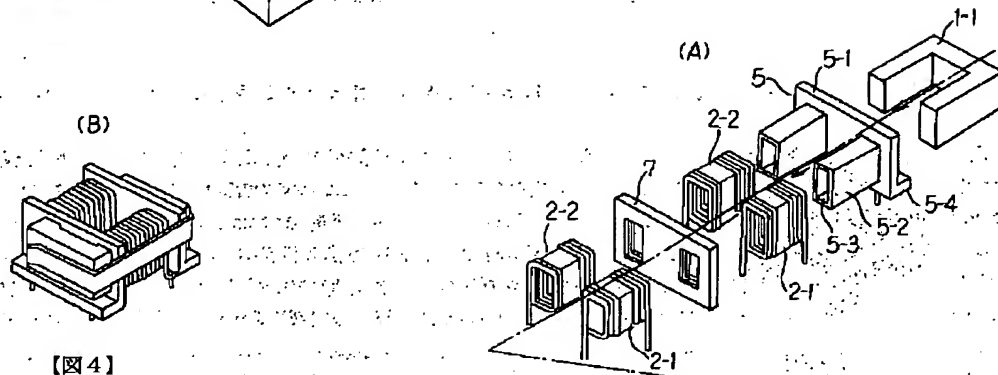
【図1】



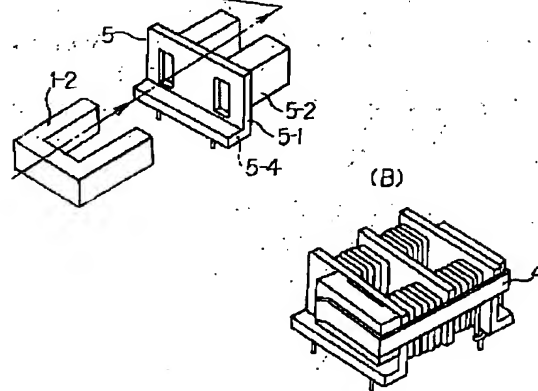
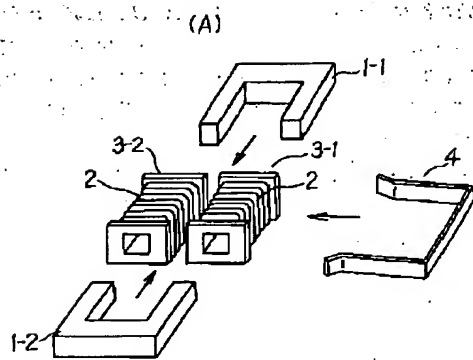
【図2】



【図3】



【図4】



(B)

